DOCUMENT RESUME

ED 204 011 PS 012 243

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TITLE Average vs. Normal IQ: An Empirical Follow-Up.
PUB DATE Apr 81
NOTE 22p.: Paper presented at the Meeting of the Rocky Mountain Psychological Association (Denver, CO, April 29-May 2, 1981).

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Elementary Secondary Education; Grade 2; *Intelligence Quotient; *Mental Disorders; *Norms; *Participant Characteristics; *Sampling; *Young Children
IDENTIFIERS Otis Lennon Mental Ability Test

ABSTRACT

The broad hypothesis that children whose histories imply the possible presence of an intellect-reducing condition will score lower on an IQ test than children whose histories do not imply such conditions was tested in a study designed to illustrate the distinction between average and normal IQ. Health and behavior histories of a sample of second grade children enrolled in the public schools of Clark County, Nevada, were obtained from their parents via a 35-item questionnaire. The Otis-Lennon Mental Abilities Test (OLMAT) was used as the measure of intelligence. Health Jeopardy (HJ), Behavior Jeopardy (BJ), and Total Jeopardy (TJ) scores were computed for each subject. These scores were then used to classify subjects into groups of increasing magnitude of jeopardy. Mean IQ scores for the groups and tests for significance of differences were computed. It was found that (1) there was no significant relationship between HJ indicators and IQ; (2) while almost all of the BJ indicators were related to OLMAT IQ in the predicted direction, some of the BJ indicators were and some were not significantly related to IQ; (3) TJ scores were found to be significantly related to IQ; and (4) the Low-Jeopardy Group, having less than two BJ indicators per subject, scored significantly higher on the OLMAT than the High Jeopardy Group. On the basis of the obtained differences, it was concluded that the distinction between normal and average IQ is not trivial. (Author/RH)

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Average vs. Normal IQ: An Empirical Follow-Up

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In a 1979 paper, Hess (1979) argued that psychology must consistently maintain a distinction between the concepts of "average" and "normal" IQ. Throughout the history of intelligence testing, he pointed out, we have used these terms interchangeable when in fact there should be a clear distinction drawn. Average represents the central tendency of the intellectual performance of a randomly-selected sample of an entire population. Normal, on the other hand, in most medical and psychological contexts, correctly bears the connotation of freedom-from-pathology. Hess argued that a norm established on a random sample of an entire population is different from a norm based upon a sample of non-pathological specimens. The former represents average performance; the latter normal. He maintained that the recognition of this distinction is important from the conceptual point of view, helping us to clarify our thinking about intellectual functioning, and from the practical point of view, through helping us identify more accurately pathological deviations from normal functioning. An IQ norm based on a free-form-pathology sample, he asserted, would be higher than one based on an all-inclusive sample, and it would show a smaller standard deviation since the extremely low IQ's caused by brain pathology would be excluded from the standardization group,

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and thus not exaggerate its variability. Such a norm would identify more clearly certain individuals functioning below the mean as suffering from significant intellectual deficits which currently often remain undiagnosed due to the depression of the mean and increase of the variance attributable to unselective sampling.

Hess cited a study by Rubin & Balow (1978) as one illustrating the feasibility of selecting pathology-free samples for the establishment of IQ norms. Through early neurological screening of a sample of over 1200 children, Rubin & Balow identified children manifesting three degrees of neuropathology (normal, slightly suspect, and confirmed pathological). The IQ's of the Ss were measured at ages 4 & 7, with the results that children free of neuropathology had an average IQ of 105.1 at age four, and 104.1 at age seven, while the average IQ of the "confirmed pathological" group was 75 at age 4, and 81 at age 7. (These means represent the present authors' approximations to correct for Rubin & Balow's elimination of three low-scoring cases.) Rubin & Balow's study, although designed for another purpose, illustrates that through the use of relevant screening and examination, pathological cases can be identified and thus excluded from norms used to measure IQ. In their study the overall mean IQ of the 1200-plus children was only about one and one-half IQ points lower than it would have been had the pathological cases been exluded. But we hypothesize that in other samples, screened by other procedures or by the same procedures augmented by additional procedures, considerably larger mean IQ differences would prevail between all-inclusive samples and samples with the presumed pathological cases eliminated.

In the Rubin & Balow study, solely neurological screening examinations were utilized. It is generally recognized that neurological procedures alone are inadequate in identifying many cases of cognitive deficit presumably attributable to brain pathology, since injury to many areas of the brain do not produce the sensory or motor defects discernible in a neurological examination, but do adversely affect intellect. Hence a screening procedure utilized for the selection of non-pathological cases for normative purposes should include other procedures, especially, 1) a health history, designed to identify and thereby eliminate Ss who have suffered demonstrable jeopardy to their neurological/intellectual status, and 2) a behavioral history, designed to identify and thereby eliminate Ss whose behavioral history is suggestive, on the basis of accepted medical/psychological knowledge, of the presence of an impairment which would tend to reduce the level of intellectual functioning. Ideally, the screening procedures for the selection of normal persons upon which IQ norms should be based would include both a clinical health examination (perhaps much broader than a neurological exam) and careful scrutiny of both the health and behavioral histories. Needless to say, the screening procedures should <u>not</u> eliminate Ss on the basis of IQ itself, since the intent of the screening is to select a sample in which the entire range of intelligence of persons free from pathology is represented.

In the literature studies abound which lend credence to the normal vs. average IQ distinctions emphasized here by the present authors. The intellectually debilitating effects of prematurity, low birth weight, anoxia, and brain trauma have been repeatedly demonstrated. Similarly,

in the behavioral realm, attention deficit, hyperactivity, and emotional problems have been implicated as correlates or precursors of reduced intellectual functioning.

The main argument of the present authors has to do with the utilization of knowledge which we already have: we feel that, knowing as we do that current norms deliberately sample pathological as well as normal cases, we should acknowledge that such heterogenous norms are inaccurate and misleading for the purpose of evaluating the normality of intelligence. In short, psychology should repudiate the yardstick it has been using since the dawn of IQ testing and adopt a new one: the normative functioning of persons who are screened as described above to enhance the liklihood of their being free from pathology.

While our purpose has thus been to proselytise for the foregoing theoretical conceptions, we have hoped to strengthen our argument via the study reported below, designed, unlike any other of which we are aware, specifically to illustrate the distinction between average and normal IQ. The broad hypothesis is that children whose histories imply the possible presence of an intellect-reducing condition will score lower on an IQ test than children whose histories do not imply such conditions. Derivative hypotheses are: 1) the mean IQ of an all-inclusive (unselected) sample will be lower than the mean IQ of the same sample when children in jeopardy of an intellect-reducing condition are excluded and 2) IQ's will be negatively correlated with the number of jeopardizing conditions revealed in the health and behavioral histories of the children studied.

Method

Subjects

The health and behavior histories of a sample of second grade children enrolled in the public schools of Clark Co., Nevada, were obtained from the parents via a questionnaire. The Clark Co., Nevada, School District distributed the questionnaire via a mailing from the central school district office. A cover letter to the parents briefly explained the project, assured anonymity, and encouraged participation. Two thousand questionnaires were sent to the parents of a randomly selected sample of second graders. About 700 replies were received (35% return) of which 641 were complete and usable.

Procedures

The Health & Behavior questionnaire consisted of 19 items, some of which had more than one part, pertaining to the health history of the child and 16 items pertaining to the behavior history. Items selected consisted of historical factors known to be antecedent to or associated with reduced intellectual functioning, or suspected by the present authors to be so associated. An example of a historical health factor known to be associated with reduced intellectual functioning is prematurity (Knobloch et.al., 1956); an example of a health factor suspected by the present authors is maternal smoking during pregnancy.

Historical behavioral factors known to be related to reduced intellectual functioning included reduced attention span, poor frustration tolerance, and sleep disturbances (Wender, 1977). The behavioral items sampled such historical factor plus others of a more speculative nature, such as

undue wearing-out of clothing.

In addition to these items concerning the health and behavior histories, the questionnaire sought information concerning the sex of the child, and the family's socio-economic status.

The Otis-Lennon Mental Abilities Test (OLMAT) (Otis & Lennon, 1969) was used as the measure of intelligence. The OLMAT is routinely administered each year to all Clark County School District second grade children.

Data Analysis

In order to demonstrate the relationship between Health Jeopardy and Behavior Jeopardy indicators and IQ, a Health Jeopardy Score (HJ), Behavior Jeopardy score (BJ), and Total Jeopardy Score (TJ) were computed for each subject. These scores were then used to classify Ss into groups of increasing magnitude of jeopardy. Mean IQ scores for the groups and tests for significance of differences were computed. Chi-Square tests were used to test the significance of relationships between jeopardy scores and IQ, and correlational analyses were performed for the same purpose.

Results

Health Jeopardy Scores

Scores on the Health Jeopardy Scale ranged from 0 to 7. Table 1 shows the number of subjects attaining each score from 0 to 7.

Table 1

Frequency Distribution of Health Jeopardy Indicators

Number of H.J. Indicators	N	%
0	233	36.3
1	202	31.5
2	110	17.2
3	59	9.2
4	14	2.2
5	14	2.2
6	8	1.2
7	1	.2
	641	100.0

From Table 1 it can be seen that 67.8%, or slightly over 2/3 of Ss demonstrated one or fewer of the HJ indicators, and that 85% of Ss had two or fewer HJ indicators. The HJ indicators most frequently reported by the parents were Rh incompatibility (N=58), bleeding during pregnancy (N=45), abnormally long or short labor (N=45), and low birth weight (N=29).

Behavior Jeopardy Scores

The range of possible scores on the Behavior Jeopardy Scale ran from 0 to 16. Table 11 provides the frequencies of Ss per number of BJ indicators.

Table II

Frequency Distribution of Behavior Jeopardy Indicators

Number of B.J. Indicators	N	%
0	244	38.1
1	110	17.2
2	86	13.4
3	42	6.6
4	38	5.9
5	35	5.5
6	25	3.9
7	18	2.8
8	16	2.5
9	9	1.4
10	9	1.4
11	5	.8
12	3	.5
13	0	0
14	0	.0
15	1	.2
16	0	0
	641	100.00

Table II reveals that 244 or 38.1%, parents reported no behavior jeopardy indicators in their child, and another 110, or 17.2%, reported only one BJ indicator, for a total of 354, or 55.2%, of parents reporting fewer than two BJ indicators. On the other hand, there were substantial numbers of parents reporting several BJ indicators: about 45% of parents reported 2 or more, and 19% reported 5 or more.

Otis-Lennon Mental Ability Test

Table III provides a frequency distribution of Otis-Lennon IQ scores by IQ categories.

Table III

Frequency Distribution of Otis-Lennon IQ Scores

IQ Range	N	%
50-59	2	.3
60-69	2	.3
70-79	3	.5
80-89	41	6.4
90-99	95	14.8
100-109	166	25.9
110-119	153	23.9
120-129	113	17.6
130-139	57	8.9
140-149	9	1.4
	641	100%

The OLMAT was constructed to yield a mean IQ of 100 and of 16 in an unselected U.S. sample. (Otis & Lennon, 1969). The mean OLMAT IQ for our sample was 110.4; the standard deviation was 14.9. A negative skew confirmed an excess of scores toward the higher end of the distribution, yielding a distribution departing somewhat from the normal.

Relationship between jeopardy indicators and OLMAT IQ scores

Health Jeopardy

The relationship between HJ scores and IQ was initially analyzed by constructing a 10 x 8 matrix (10 levels of IQ, ranging from 50 to 149, and 8 HJ categories, corresponding to HJ indicators of 0-7), and performing a Chi-Square Test. The result did not demonstrate a significant relationship between HJ indicators and IQ. Possible reason for this failure to demonstrate the expected relationship will be discussed later.

While an overall relationship between HJ indicators and IQ was not shown, several of the individual HJ indicators appear to be related to below-average IQ for this sample, as anticipated. Health jeopardy indicators related to below-average IQ included precipitous labor, prolonged labor, low birth weight, maternal injury during pregnancy, presence of a birth defect, and the requirement for oxygen following birth. Health jeopardy indicators unexpectedly not associated with below-average IQ in this sample included: prematurity and post maturity, maternal bleeding during pregnancy, threatened miscarriage, birth injury (N only equaled 5), and the child's general health.

Behavior Jeopardy

The relationships between BJ indicators and IQ were given a preliminary analysis via the Chi-Square test, as was done with the HJ indicators. The 10 x 17 matrix yielded a X^2 of 458 with 144 degrees of freedom, significance beyond .001. A clear relationship between the BJ indicators and OLMAT IQ was thus established. Further analysis demonstrated a progressive decline in IQ scores as a function of increasing BJ indicators. Table IV illustrates the same data graphically.

Individual BJ indicators: Almost all of the BJ indicators were related to OLMAT IQ in the predicted direction, but some were not significantly related to IQ. Among the BJ indicators which were significantly related to IQ were problems in reading, comprehension, planning, wearing out clothes, attention span, coordination, discipline, memory, affection-seeking, and nervousness.

Total Jeopardy Scores and IQ

As would be anticipated from the preceding results, and consistent with our primary hypothesis, Total Jeopardy scores (an unweighted sum of HJ & BJ scores) were found to be significantly related to IQ ($r = -.24$, $p < .001$). Since the HJ scores alone are not significantly related to the OLMAT scores ($r = -.04$, $p < .14$), it is clear that the relationship between the Total Jeopardy Score and IQ is the result of the strong relationship between the BJ score and the OLMAT IQ.

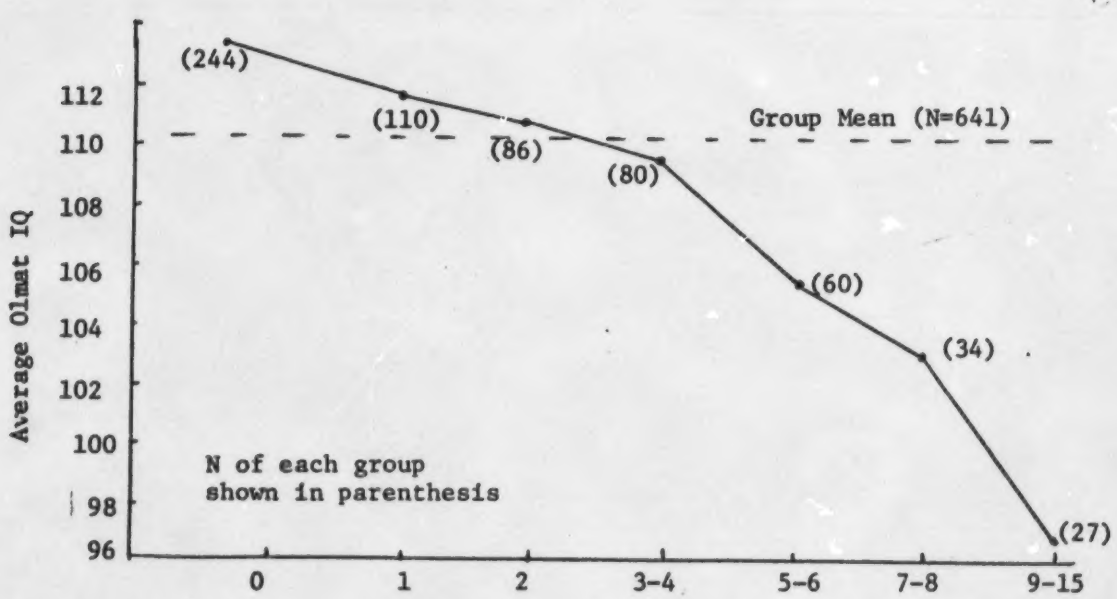
Table IV

OLMAT IQ as Related to Behavioral Jeopardy Indicators

BJ score	N	OLMAT Mean
0	244	113.4
1	110	111.9
2	86	110.8
3 & 4	80	109.7
5 & 6	60	105.6
7 & 8	34	103.1
9 - 16	27	96.9
	641	110.4

Figure 1

Mean OLMAT IQs of groups of increasing Behavior Jeopardy Scores



Comparison of mean IQs for the jeopardized and non-jeopardized groups, and total research sample

To this point, the results presented have dealt primarily with the HJ & BJ variables, singly and together, and their relationships to OLMAT IQ as revealed by Chi Square and correlational analysis. At this point the data will be presented in a fashion intended to reflect most directly on the main hypothesis of the study, namely, that IQ norms based on normal and jeopardized groups will differ significantly. For the purpose of this comparison, the research sample has first been divided into two groups on the basis of their BJ scores: Group 1, the Low-Jeopardy Group, consists of those 344 Ss having fewer than two BJ indicators; Gruop 2, High-Jeopardy Group, the remaining 297 Ss, who have two or more BJ indicators. This division of the sample into relatively non-jeopardized and jeopardized groups provides the least powerful test of our hypothesis, since it simply divides the entire sample into approximate halves (as closely as the distribution of scores permits), and it excludes no "grey area" of ambiguous, in-between, "partially jeopardized" cases.

Table V compares OLMAT IQ means and sigmas for the Low BJ and High BJ Groups, and for the total sample.

Table V

Means and Standard Deviation of Low BJ & High BJ Groups, and Total Sample

Group	BJ Score	N	$\bar{X}$ IQ	Standard Deviation	t	p
Low BJ	0-1	354	112.9	15.0	4.94	$p < .001$
High BJ	2-16	287	107.2	14.1	2.20	$p < .015$
Total	0-16	641	110.4	14.9		

Table V demonstrates that by the most rigorous test of our hypothesis, using the BJ data, low-jeopardy and high jeopardy groups differ significantly in the predicted direction, and by an amount (5.7 IQ points) which is greater than one-third of a standard deviation on the OLMAT, and is about the magnitude the SEm (6.2) of the OLMAT for 7-year olds. Moreover, our "normal" (low-jeopardy) group differs significantly at the .015 level, from the "average" group (the entire sample) by 2.5 IQ points, or about one-sixth of an OLMAT standard deviation.

Discussion

This paper should be construed primarily as an exhortation addressed to our colleagues rather than an empirical research study. There is little surprise that our hypothesis has been substantially supported; indeed, if the study contains any surprises they consist of our failure to demonstrate the effect of some already-established jeopardizing factors, such as prematurity and birth injury, upon later IQ. We think that the present study does offer us another opportunity to speak of the current feasibility, and hence, necessity, to establish a new standard for the measurement of intellect, namely, a standard consisting of norms established on persons whose health and behavioral histories and neurological examinations contraindicate their having been subject to pre, peri, and post-natal factors known to jeopardize subsequent intellectual performance. Our goal is to have psychologists adopt normal intellectual functioning as their reference point for measurement, rather than average intellectual functioning. We would not exclude from norms those persons whose intellectual variations are of a residual (i.e. not-jeopardy-produced) nature, and thus presumably

the consequence of genetic variation within a culture.

One exception to the preceding statement would occur with those genetic conditions or genetically-predisposed conditions known to affect intellectual performance, including but not limited to schizophrenia, manic-depressive psychosis, and phenylketonuria.

The distinction between normal and average IQ is not trivial, as suggested by the 2.5 IQ point difference between our "normal" and "average" groups. The facts suggest that the real IQ difference between carefully screened normal groups and average groups many run much higher. It will be recalled from the above results than our 244 Ss with BJ scores of zero earned a mean OLMAT IQ of 113.4 points, a full 3 IQ points higher than the mean for the entire sample. If that sample of 244 were to undergo a successive screening for HJ factors (a screening we have not performed yet) and another screening via actual physical/neurological examination, it is likely the mean IQ of the remaining sample would surpass the 113.4 level of our current sample.

Note also that our <u>total</u> sample had already been fairly rigorously screened by social and educational processes before becoming available to us. Our sample consisted of second graders enrolled in the classes of the Clark County School District. Children too immature to attend school by age 7, and institutionalized children were thereby excluded from our "average" sample, even though such children are generally deliberately included, proportionate to their representation in the general population, in the norms of our major individual intelligence tests (Weschler, 1974, p. 19).

(Some of these non-school children are evidently not included in the norms on the OLMAT.)

Another pre-screening effect in the present study probably occurred as a result of the voluntary-participation nature of the study. Some evidence derived from the socio-economic status of respondents and from the high mean IQ of the children suggest that parents who responded to our questionnaire tended to be brighter, more educated, from higher socio-economic status, and, perhaps, prouder of the intellectual accomplishments of their children. We think these factors may have served to reduce the proportion of jeopardized children in our sample, and thus minimize the obtained differences between "normal" and "average" IQ.

Further serving to reduce the proportion of children identified in our sample as "jeopardized" was the preliminary nature of our research. Our screening questionnaire was a simple first attempt, upon which we could improve greatly already as a result of our experience in this research. Little representation was provided in it for factors such as environmental pollutants and poisons, parental (especially, paternal) exposure to drugs and pollutants, genetic conditions, or a myriad of other variables known or suspected to be associated with reduction in intellectual capacity. Moreover, the inclusion of some apparently invalid items in our questionnaire further vitiated its initial efficacy. Ultimately screening procedures will probably include appropriate weighting of predictor variables according to their predictive utility in a multiple-regression-equation to most effectively identify jeopardized Ss.

The Proportion of persons who might require exclusion from IQ norms .

It is said that sixty percent of American adults wear eyeglasses, and still others should wear them. It is likely, then, that if our "norms" for 20/20 vision were established via a sampling procedure, upwards of two-thirds of adults would have to be excluded from the samples in order for the normative visual norms to approximate the common Snellen standard. Our experience in the present study suggests that a similar proportion of persons might have to be excluded from samples on which IQ norms are to be based if they are to represent the functioning of non-jeopardized individuals. You will recall that 244, or 38.1%, of our sample had no Behavior Jeopardy indicators. Further data analysis yet to be done will certainly reveal that this proportion will be reduced further when those Ss having one or more valid IQ-related Health Jeopardy indicators are removed from the sample. Even further reduction of the proportion of the ostensibly non-jeopardized Ss will occur in future studies which more comprehensively identify possible IQ-jeopardizing factors. Finally, among older populations, e.g., adults, it can be assumed that an even greater proportion of cases will need to be excluded, in view of the fact that many jeopardizing conditions occur as the result of risks, e.g. illness and injury, to which persons are continually exposed, and which therefore affect a progressively increasing proportion of persons as the population age increases.

A rationale for selection of Behavior Jeopardy indicators

We would like to stress at this time a point made earlier concerning the selection of items for jeopardy questionnaires used for screening

purposes. The intent of any item is to reveal the presence of any pathological conditions likely to adversely affect intellectual functioning. Health Jeopardy items are relatively obvious in their design to reveal underlying health problems or history of illness or injury possibly related to IQ. The Behavior Jeopardy items, while not always clearly distinguishable from Health Jeopardy items (for example, is a history of "nervousness" a matter of the health history, behavior history, or both?), may be incorrectly construed as designed to reflect intellectual levels. For example, in our present BJ questionnaire, we inquire about the child's having a history of short attention span. The purpose of that item, as of all items on the Health and Behavioral Questionnaire, is to provide evidence of an antecedent or contemporary pathological condition, e.g. minimal brain dysfunction, which would exclude the individual from norms constructed in the manner we recommend. It may well be asked whether our BJ items succeeded only because they reflect directly on some aspect of current intellectual functioning: that rather than revealing some antecedent underlying pathological condition, they merely constitute a direct measure of one facet of impaired intellect. We feel that this is not the case, since our choice of items was dictated by well-established behavioral indices of pathological conditions related to but not synonymous with impaired intelligence. Yet caution must be exercized in the choice of items, lest this possible contamination of results occurs. Couching many items as we did in terms avoiding direct reference to intellectual functions is one suggested precaution. In attempting to ascertain the presence of minimal brain dysfunction, for example, inquiry about frustration

tolerance, hyperactivity, and expression of affect might identify the syndrome as reliably as those focusing more directly on the cognitive aspects of the syndrome, and without the aforementioned dangers of indirectly measuring the criterion, IQ, via the screening device.

Not only should items used for Jeopardy screening point to antecedents or underlying pathological conditions possibly adversely affecting IQ, but they should identify environmental conditions exposure to which could produce cumulative effects upon the individual resulting in reduced intellectual functioning. Since the purpose of the screening procedure is to permit the selection of a "normal" sample, both the organism itself and its habitat must be free of pathogenic conditions. Definition of a normal habitat for persons across cultures would be difficult if not impossible, but within a culture it should constitute no major problem. In our own culture, adequate nutrition, opportunity to learn, a relationship with at least one significant parent figure, and freedom from extreme environmental stressors would constitute a beginning of a definition of a normal human habitat.

Jeopardy and ethnicity. Above we have criticized current IQ test norms as inaccurate and misleading, based as they are on the intellectual functioning of both impaired and normal persons. At the present we would like to extend our criticism concerning group averages beyond standardization groups to generalizations concerning the IQ of different racial and ethnic groups. If our general IQ norms are inaccurate, as we maintain, as a consequence of including jeopardized persons, then of course any group means will be inaccurate to the extent that they reflect the intellectual

functioning of such jeopardized persons. Since minorities in the U.S. are known to be subject to more jeopardizing conditions - e.g. low birth weight, poor nutrition, poor pre-natal care, poverty, etc., it is clear that group IQ averages of minorities will reflect their group's normal intellectual functioning even more poorly than they do for our general IQ norms. A suggestion for more accurate representation of the normal intellectual functioning of ethnic and racial minorities stemming from the present study is that the screening procedures described above be utilized in the establishment of any ethnic group norms. This procedure, which has something in common with the methodology used in comparison studies of IQ's of Blacks from Northern middle-class families (Klineberg, 1963), has the advantage of applying precisely the same screening procedure to all candidates for inclusion in group norms, whether or not the groups are comprised of minority members.

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